CATEGORY (CAT) II AND III
PRECISION MINIMUMS REQUIREMENTS

1.0 GROUND EQUIPMENT.

Instrument Landing System (ILS), Microwave Landing System (MLS), and Global Navigation Satellite System (GNSS) Landing System (GLS) characteristics, including facility classifications, are specified in the following publications: AC 120-29, Criteria for Approving CAT I and II Landing Minima for FAR 121 Operators; and AC 120-28, Criteria for Approval of CAT III Weather Minima for Takeoff, Landing and Roll-out, for ILS, MLS, or GLS. AC 120-28 refers to use of International Civil Aviation Organization (ICAO) Annex 10 criteria, Order 6750.24, Instrument Landing System (ILS) and Ancillary Electronic Component Configuration & Performance Requirements, and the applicable NAVAID classification for CAT III operations. NAVAID use is predicated on applicable ILS, MLS, or GLS performance classifications; e.g., ILS III/E/2, GLS II/D/2, or equivalent classification at non-U.S. facilities. For GLS, an appropriate equivalent performance classification to ILS, as specified by FAA or the ICAO, may also be used; e.g., Performance Level/Coverage/Integrity as in “II/T/1”.

2.0 LIGHTING FACILITIES.

Exceptions to lighting criteria may be authorized only if an equivalent level of safety can be demonstrated by an alternate means. Examples of exceptions are: substitution for required approach lighting components due to an approved specific aircraft system providing equivalent information or performance (such as radar based electronic voice switching system (EVS)), or computed runway centerline information which has redundant high integrity, displayed on a heads-up display (HUD), etc.

2.1 CAT II/III LIGHTING REQUIREMENTS.

CAT II or III operations require the four lighting systems below:

2.1.1 **United States (U.S.) standard** ALSF-1 or ALSF-2 approach lights;

2.1.2 **U.S. standard** touchdown zone lights;

2.1.3 **U.S. standard** runway centerline lights, and

2.1.4 **U.S. standard** high intensity runway lights.

2.2 ADDITIONAL CAT III OPERATION REQUIREMENTS.

An FAA approved plan per AC 120-57, Surface Movement Guidance and Control System (SMGCS), is required for operations below 1200 RVR.

3.0 MARKING AND SIGNS.

Airports approved for CAT II/III operations must include the following runway and taxiway markings and airport surface signs, or ICAO equivalent, unless approved by AFS-400 (e.g., for Non-United States airports). Markings and signs must be in a serviceable condition as determined by the airport authority (in the United States, normally monitored by FAA Airport Certification Inspectors). Aircraft operators or any FAA personnel (aviation safety inspectors, etc.) should report deteriorated or unserviceable markings or signs to the airport authority. At non-United States airports, any unsafe or unserviceable situations should immediately be brought to the attention of the U.S. carriers and the appropriate Certificate Holding District Office (CHDO). Other guidance, such as Order 6750.24, OpSpecs, and an approved SMGCS plan, may permit operational contingencies or exceptions. Examples of these actions are: snow removal, rubber deposit removal on runway touchdown zone markings or centerline markings, critical area hold line or runway centerline marking repainting, runway hold line sign snow removal, etc.

3.1 CAT II/III OPERATIONS REQUIRE THE FOLLOWING:

3.1.1 **U.S. standard precision instrument runway markings and signs.**

3.1.2 **U.S. standard taxiway edge and centerline markings**.

3.1.3 **Runway signs,** taxiway signs, hold line signs, taxiway reference point markings (if required by SMGCS), and NAVAID ILS critical area signs and markings.

3.1.4 **ILS/MLS Critical Area Signs and Markings.** See FAA Order 6750.16, Siting Criteria for Instrument Landing Systems, for critical area descriptions.

4.0 APPROACH MINIMUMS.

CAT II/III procedures require special authorization from the FAA. AC 120-29 (as amended) contains equipment and flight crew qualifications. Operators desiring lower than CAT I minimums, require operations specifications (OpsSpecs) authorization for air carrier operations or a Letter of Authorization (LOA) for 14 CFR Part 91 operations. Tables A1-1 lists lowest authorized minimums, but individual operators may require higher minimums. Higher minimums may also be necessary based on environmental factors in the vicinity of the airport or other Flight Standards requirements.

4.1 CAT II MINIMUMS.

Class II/T/2 facility class of performance is required for CAT II operations. The lowest CAT II height above threshold (HAT)/RVR values in feet are 100/1,200. Table A1-1 lists RVR values for HAT values greater than 100.

Table A1-1. Lowest CAT II Minimums

HAT (feet)	RVR (feet)
101-140 (1-40 adjustment)	1200*
141-180 (41-80 adjustment)	1600
181-199 (81-99 adjustment)	1800

NOTE: Chart the lowest authorized CAT II RVR
*As low as 1000 by Ops Spec

4.1.1 Adjustment of CAT II Minimums. The HAT is measured in feet from the highest elevation of the runway in the touchdown area, and runway visual range (RVR) in feet. The lowest attainable values are a HAT of 100 feet and RVR of 1,200 feet. Application of CAT II obstruction clearance criteria may identify objects that exceed the allowable height in the touchdown area or penetrate the approach light surface. In such cases, adjustment to the decision height shall be made as follows:

4.1.1 **a. Final Approach Surface.** Requires a special study of local features and conditions before CAT II operations can be authorized by the FAA Flight Standards Service.

4.1.1 **b. Approach Light Surface and Touchdown Area.** Adjust the decision height (DH) upward one-foot for each foot an object exceeds the allowable height. The RVR value will then be adjusted as indicated in table A1-1.

4.1.1 **c. Minimum HAT Value.** The minimum HAT value for CAT II operations is 100 feet where the runway centerline to taxiway centerline separation is 600 feet or greater. This value may be also be achieved with:

4.1.1 **c. (1) Runway taxiway centerline separation of 500 feet** at elevations of 4,000 feet and below, provided taxi operations are restricted to aircraft with wingspans less than 214 feet and tail heights less than 66 feet.

4.1.1 **c. (2) Runway taxiway centerline separation of 400 feet** at elevations of 4,000 feet and below, provided taxi operations are restricted to aircraft with wingspans less than 171 feet and tail heights less than 55 feet.

4.1.1 **c. (3) Larger aircraft flying the approach or taxiing** on parallel taxiways, or taxiway/runway separation less than stated above require a collision risk analysis to determine the minimum HAT value.

4.2 CAT II/III MINIMUMS.

Publish the lowest authorized CAT III RVR when the runway supports unrestricted CAT I and II operations. When CAT I or II operations for a runway are restricted, CAT III minimums for the runway must be determined by a collision risk analysis. The following is the minimum class of performance (AC 120-29, appendix 2) required for an ILS to support a published FAR Part 97 CAT II or III, Standard Instrument Approach Procedure (SIAP):

4.2.1 Class III/D/3. Required for Cat III operations with visibility ≥ RVR 600.

NOTE: CAT III procedures with facility class III-D3 performance require the notation "Localizer not suitable for Electronic Rollout Guidance."

4.2.2 Class III/E/3. Required for CAT III operations with visibility ≥ RVR 600.

4.2.3 Class III/E/4. Required for CAT III operations with visibility < RVR 600.

5.0 FINAL APPROACH SEGMENT.

Develop the final approach segment under TERPS Volume 3, Chapter 3 criteria, with the following exceptions:

5.0.1 Final Approach Course Alignment. The final course alignment must be coincident with the runway centerline.

5.0.2 Final Segment Obstacle Clearance Surface (OCS) Penetrations. Penetrations of the primary (W, X) surfaces are not authorized. Taxiing aircraft are obstructions in the final segment analysis. If the "W" or "X" surface is penetrated by a taxiing aircraft (tail height), request a collision risk analysis and approval from the Flight Procedure Standards Branch, AFS-420, P.O. Box 25082, Oklahoma City, Oklahoma, 73125.

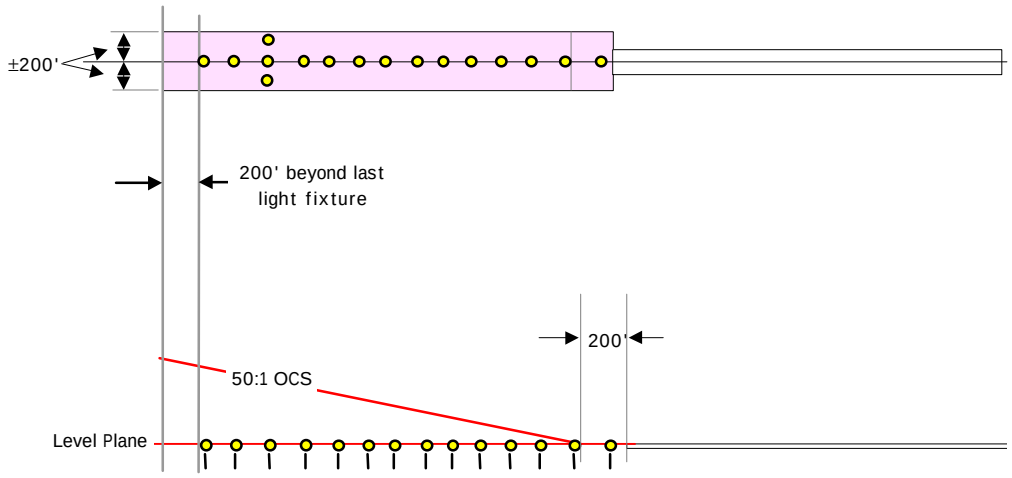
5.1 OBSTRUCTION ASSESSMENT.

Evaluate the final segment under chapter 3 of this TERPS volume. If DH adjustments are required for obstruction penetrations in the "Y" surface, adjust the HAT upward one foot for each foot the penetration exceeds the allowable height.

5.2 APPROACH LIGHT AREA.

Airports Division is responsible for maintaining obstruction requirements in AC 150/5300-13, Airport Design. Obstructions shall not penetrate the approach light area (level plane and 50:1 OCS)(see figure A1-2). The clearance required above interstate highways is 17 feet, for railroads 23 feet, and for all other roads, highways, and vehicle parking areas 15 feet.

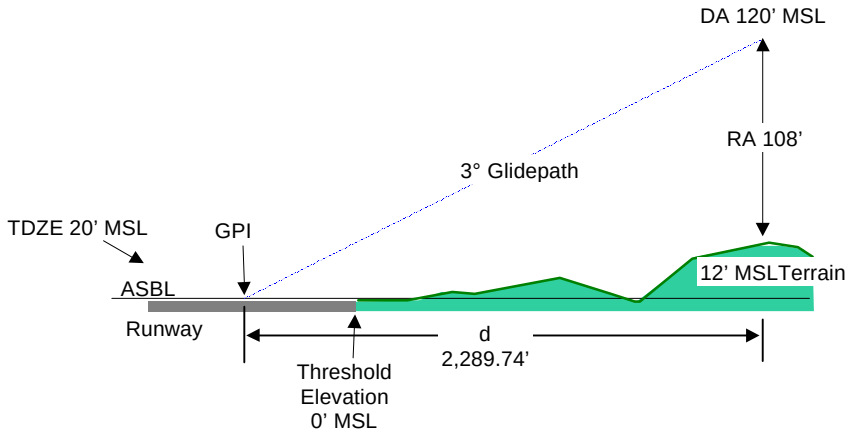
Figure A1-2. Inner Approach OFZ
Approach Light Area



5.3 CALCULATION OF RADIO ALTIMETER (RA) HEIGHT.

To determine RA height, determine the distance (d) from ground point of intercept (GPI) to the point decision altitude (DA) occurs. Obtain the terrain elevation d feet from GPI on the runway centerline extended. Subtract the terrain elevation from the DA to calculate the RA (see figure A1-3).

Figure A1-3. Calculating RA



$$d = \frac{DA - Threshold\ Elev}{Tan(GPA)} \qquad d = \frac{120 - 0}{Tan\ 3°} \qquad d = 2{,}289.74'$$

$$RA = DA - Terrain\ Elev \qquad RA = 120 - 12 \qquad RA = 108$$

6.0 MISSED APPROACH OBSTRUCTION EVALUATION FOR CAT II AND III AUTHORIZATION.

Section 1 of the missed approach segment is significantly different from the CAT I precision standard. The CAT II/III Section 1 begins at the end of the final OCS trapezoid, is aligned with the final approach course, and continues in the direction of landing for a distance of 1.5 NM. It is comprised of 3 subsections: Section 1A, Section 1B, and Section 1C. The section 1 OCS's should not be penetrated except by NAVAID's and ancillary facilities fixed by functional purpose.

6.0.1 Acceptable obstructions are:

6.0.1 **a. All Visual Aids on Frangible Mounts.** For approach lighting system components including visual glide slope indicators (VGSI's), the maximum height is as specified by the latest edition of Order 6850.2. For taxiway signs, the latest edition of AC 150/5340-18 specifies the maximum height.

6.0.1 **b. ILS glide slope antenna** or monitor masts and automated surface observing system (ASOS) wind sensor towers, which are permitted to exceed 15 feet above the elevation of the points on the runway centerline abeam them.

6.0.1 **c. Glide slope shelter**, precision approach radar (PAR), RVR, and ASOS components, which shall not exceed a height of 15 feet above the elevation of the point on the runway centerline abeam them (except ASOS wind sensor towers, which may exceed 15 feet). These structures are recommended to be located at least 400 feet from runway centerline; the minimum distance is specified in AC 6750-16, , except where an RVR component must be sited less than 400 feet from runway centerline. Obstructions more than 15 feet above the runway centerline elevation may be permitted if the minimum distance from the runway centerline is increased 10 feet for each foot the structure exceeds 15 feet. Frangible PAR reflectors are not considered obstructions.

6.0.1 **d. Aircraft taxiing via a parallel** or adjacent taxiway and clear of the obstacle free zone (OFZ) (see AC 150/5300-13) MAY penetrate the CAT II/III missed approach surfaces PROVIDED the runway centerline to taxiway centerline distances and aircraft dimensions standards contained in paragraphs 4.1.1.-4.1.1c(3) are met. Perform a collision risk analysis where the airport elevation is greater than 4,000 feet MSL, where aircraft with wingspans or tail heights are greater than in the specified paragraphs, or for taxi on existing or proposed taxiways that are less than the specified distances from runway centerline. Supporting data required for completing the ICAO Collision Risk Model (CRM) analysis is contained in FAA Order 8260.4, ILS Obstacle Risk Analysis. The data includes airport elevation, largest aircraft type, estimated number of this type of aircraft that could typically be occupying the parallel taxiway during CAT II or III operations, and all obstructions relevant to a CRM analysis in the vicinity of the airport. The taxiing operation during CAT II/III operations will be approved by the Flight Standards Service. Required operational conditions and/or limitations will be specified in the approval documentation.

6.1 SECTION 1A.

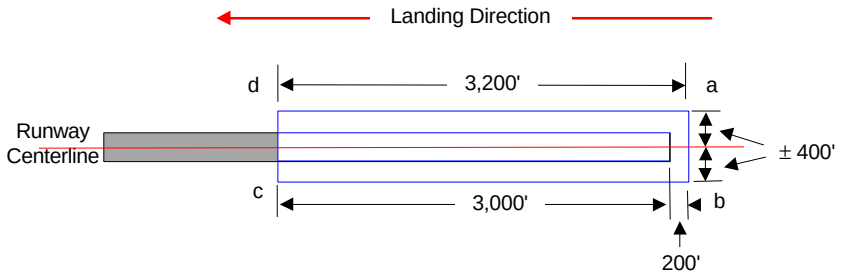
Section 1a is the touchdown area. See figure A1-4.

6.1.1 Area.

6.1.1 **a. Length.** Section 1A begins at the end of the final "W" OCS area (ab line). It extends a distance of 3,200 feet in the direction of landing to a point 3,000 feet from runway threshold (RWT) (cd line).

6.1.1 **b. Width.** Total width of the area is 800 feet (± 400' from centerline).

Figure A1-4. Section 1A. *Touchdown Area*



6.1.1 **c. OCS.** The surface elevation within this area is equal to the elevation of a point on the runway centerline perpendicular to the obstruction being evaluated. The only obstructions permitted in the touchdown area are those obstructions that are fixed by their functional purpose or those required for the approaches. Parked aircraft are not permitted within this area. This area must be free of obstruction penetrations, except for frangible visual NAVAID's that are required for CAT II and III operations. All obstructions, except visual aids and frangible functional objects, must be marked and lighted in accordance with AC 150/5340-18, Standards for Airport Sign Systems, unless shielded by a properly lighted and marked object.

6.2 SECTION 1B.

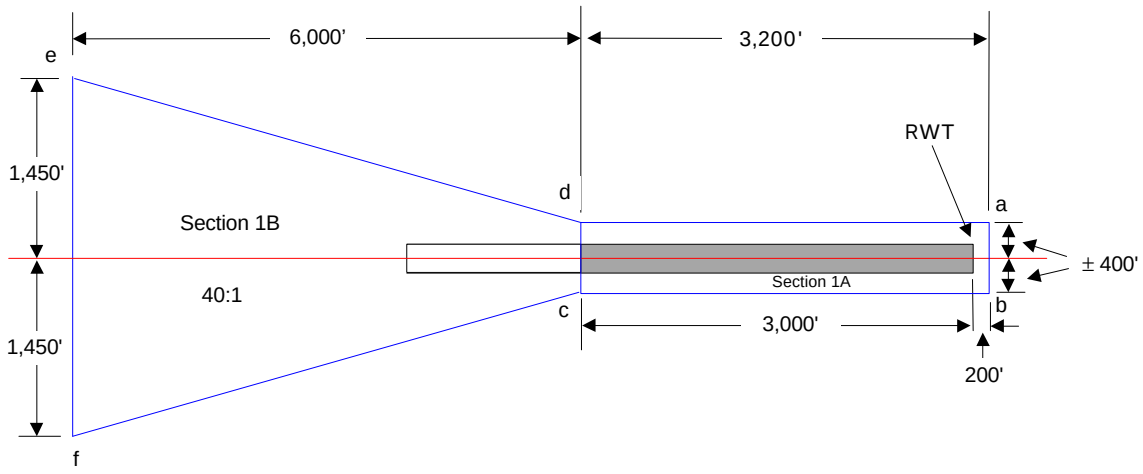
Section 1B begins along a line defining the end of section 1A (cd line) (see figure A1-5).

6.2.1 Area.

6.2.1 **a. Length.** The area extends 6,000 feet from the cd line along the runway centerline.

6.2.1 **b. Width.** The area expands from ± 400 feet at the cd line to ± 1,450 feet at the end of the section (ef line).

Figure A1-5 Section 1B



6.2.1 **c. OCS.** Section 1B is a 40:1 surface that begins at the elevation of the runway centerline 3,000 feet from the RWT, and rises to a height of 150 feet above ASBL. Evaluate obstructions using the shortest distance from the obstruction to the beginning of section 1B (cd line). This surface must be free of penetrations to approve CAT II or III operations.

6.3 SECTION 1C.

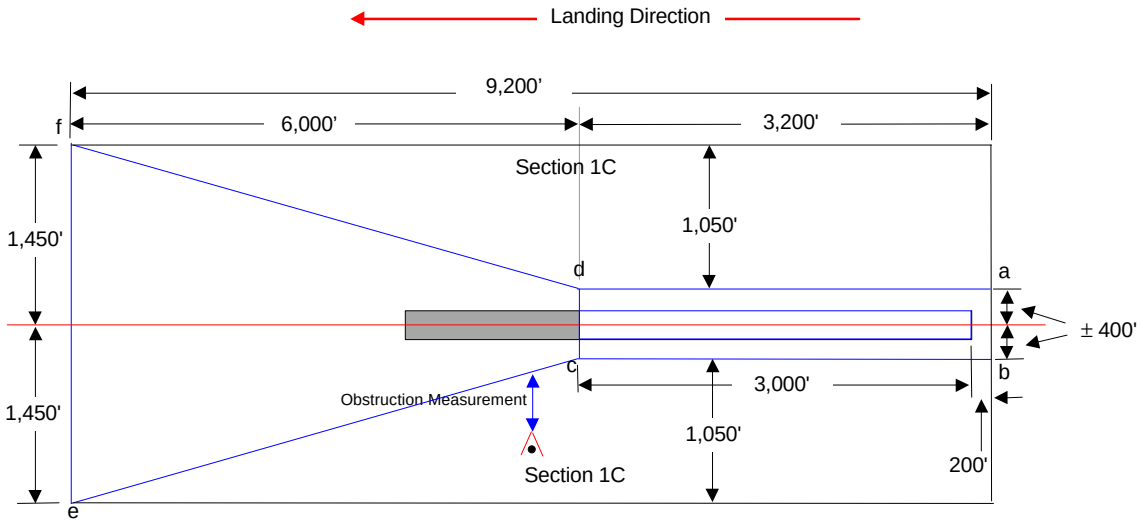
Touchdown Area Transitional Surfaces (see figure A1-6).

6.3.1 Area. Section 1C consists of two parts, one on each side of the runway adjacent to sections 1a and 1B. The areas begin at the beginning of section 1A (ab line) and extend in the direction of landing.

6.3.1 **a. Length.** The length of Section 1C is approximately 1.5 NM (9,200 feet).

6.3.1 **b. Width.** The width of the section is 1,050 feet from its beginning (ab line) to a point abeam the cd line. This width tapers from 1,050 feet abeam the cd line, to zero at the end of section 1B (ef line).

Figure A1-6. Section 1C



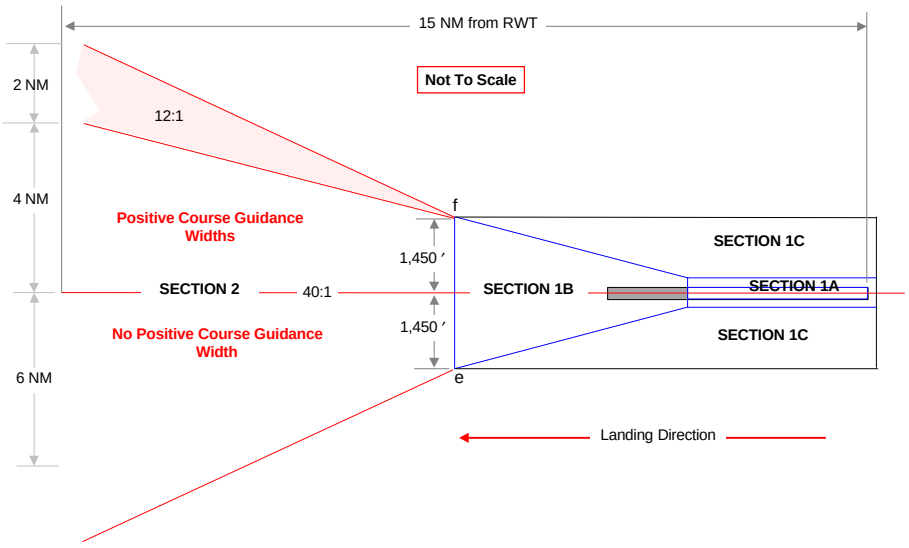
6.3.1 **c. OCS.** Section 1C is a 7:1 surface that rises perpendicular to the missed approach course from the elevation and boundary edge of section 1A or B to a height of approximately 150 feet above the ASBL. Evaluate obstructions measuring perpendicular to the missed approach course, from the outer edge of section 1A or 1B to the obstruction. The OCS should not be penetrated. A structure, such as a building or tower, which penetrates section 1C is an obstruction to CAT II/III landing operations even when the same obstruction does not penetrate the OFZ. When fixed obstructions penetrate the OCS, and when deemed necessary and approved by the Flight Standards Service, adjust RVR minimums commensurate with the degree of interference presented by the obstruction. Publish the RVR required in application of table A1-1 as if the HAT were adjusted for the penetration. Do not adjust the HAT. Add a cautionary note to the approach procedure to identify the obstruction. Parked aircraft that penetrate section 1C are considered an obstruction to CAT II/III landing operations.

6.4 **SECTION 2.** See figure A1-7.

6.4.1 **Area.**

6.4.1 **a. Straight-ahead Missed Approach Area.** This portion of the area starts at the end of section 1 and is centered on a continuation of the section 1 course. The width increases uniformly from 3,100 feet at the beginning to 12 miles at a point 15 miles from the runway threshold. When positive course guidance is provided for the missed approach procedure, secondary reduction areas which are zero miles wide at the point of beginning and increase uniformly to 2 miles wide at the end of section 2, must be added to section 2 (see figure 3-15).

Figure A1-7. Section 2, NON-RNAV



6.4.1 **b. Turning Missed Approach Area.** (Applies to turns of over 15°). See figures A1-8 and A1-9. The design of the turning missed approach area assumes that aircraft missing an approach will climb straight ahead until reaching a height of at least 300 feet above the elevation of the runway centerline at the end of the touchdown area. The procedure will identify the obstruction if a turn toward a significant obstruction has to be made. The turning flight track radius shall be 1.75 miles and it shall be plotted to begin at the end of section 1. The outer boundary of section 2 shall be drawn with a 3.5 mile radius. The inner boundary line shall commence at the outer edge of the section 1C surface opposite the end of the touchdown area. The outer and inner boundary lines shall terminate at points 4 miles each side of the assumed flight track 15 miles from the runway threshold. Where secondary areas are required, they shall commence after completion of the turn. Turns in the missed approach area are normally specified to commence after reaching a height of 300 feet. Where an operational requirement exists to continue the climb of the aircraft to a height of more than 300 feet prior to commencing a turn, section 1 will continue to increase uniformly in width, and will be extended longitudinally 4,000 feet for each 100 feet of height over 300 feet. In addition, section 1C is also extended laterally on the inside of the turn to a height equal to the elevation attained by the extension of section 1.

Figure A1-8. Turning Missed Approach Detail

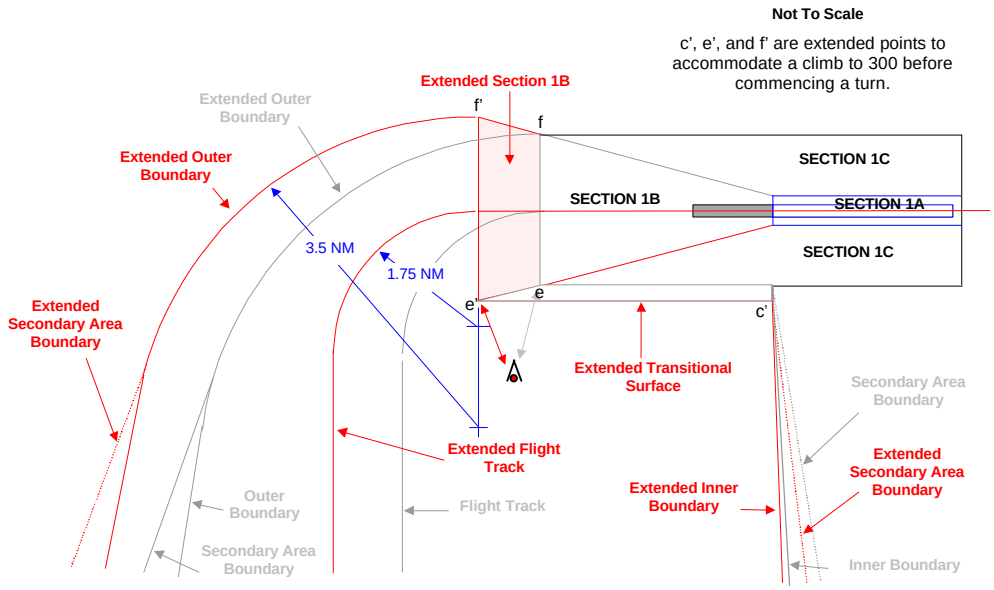
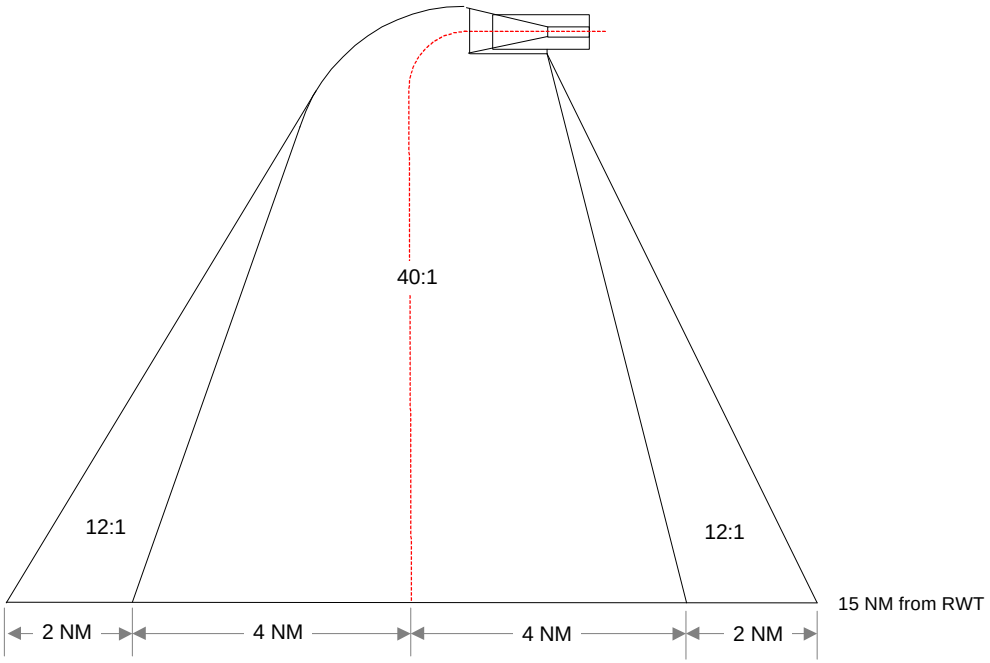


Figure A1-9. Turning Missed Approach Detail - continued



6.4.1 **c. Obstructions in the Missed Approach Area.** The 40:1 missed approach surface identifies obstructions which may be a hazard in the missed approach area. When an object penetrates the 40:1 surface, the missed approach procedure will contain a note specifying the minimum rate of climb required to clear the obstruction by the number of feet determined by the following formula:

Clearance=0.31579 x (obstruction height above DER). The climb gradient is effective until reaching a hundred-foot (3,100; 1,600; etc.) altitude from which the 40:1 surface is clear. Do not publish climb gradients less than 152 feet per NM.

Example: NOTE: **"MISSED APPROACH OBSTRUCTIONS REQUIRE A CLIMB GRADIENT OF 190 FEET/NM (315 FPM/100 KT, 470 FPM/150 KT, 630 FPM/KT) TO 3,100 FEET, NO WIND CONDITIONS**."